IES-5000 Series

Integrated Ethernet Switch

User's Guide

Version 1.1
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ZyXEL

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- To reduce the risk of fire, use only No. 26 AWG (American Wire Gauge) or larger telecommunication line cord.
- Do NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel can service the device. Please contact your vendor for further information.
- Use ONLY an appropriate power supply for your device. See the appendices for details.
- Do NOT use the device if the power supply is damaged as it might cause electrocution.
- If the power supply is damaged, remove it from the power outlet.
- Do NOT attempt to repair the power supply. Contact your local vendor to order a new power supply.
- Place connecting cables carefully so that no one will step on them or stumble over them. Do NOT allow anything to rest on the power cord and do NOT locate the product where anyone can walk on the power cord.
- Do NOT install nor use your device during a thunderstorm. There may be a remote risk of electric shock from lightning.
- Do NOT expose your device to dampness, dust or corrosive liquids.
- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Make sure to connect the cables to the correct ports.
- Do NOT obstruct the device ventilation slots, as insufficient airflow may harm your device.
- Do NOT store things on the device.
- Connect ONLY suitable accessories to the device.

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ZyXEL warrants to the original end user (purchaser) that this product is free from any defects in materials or workmanship for a period of up to two years from the date of purchase. During the warranty period, and upon proof of purchase, should the product have indications of failure due to faulty workmanship and/or materials, ZyXEL will, at its discretion, repair or replace the defective products or components without charge for either parts or labor, and to whatever extent it shall deem necessary to restore the product or components to proper operating condition. Any replacement will consist of a new or re-manufactured functionally equivalent product of equal or higher value, and will be solely at the discretion of ZyXEL. This warranty shall not apply if the product has been modified, misused, tampered with, damaged by an act of God, or subjected to abnormal working conditions.

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Customer Support

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- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

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a. "+" is the (prefix) number you enter to make an international telephone call.

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Preface

Congratulations on your purchase of the IES-5000 series Integrated Ethernet Switch.

About This User's Guide

This user's guide gives hardware installation, connection and maintenance instructions. It also gives specifications.

Syntax Conventions

- "e.g.," is a shorthand for "for instance", and "i.e.," means "that is" or "in other words".

Naming Conventions

- The IES-5000 or IES-5005 may be referred to as the IES-5000 or the IES. Differentiation is made where needed.
- Unless otherwise specified, IES-5000 refers to the IES-5000 or IES-5005 main chassis and its cards along with the IES-5000 or IES-5005 splitter chassis and its cards.
- The IES-5000M is the IES-5000 main chassis.
- The IES-5005M is the IES-5005 main chassis.
- The IES-5000ST is the IES-5000 splitter chassis with Telco-50 connectors.
- The IES-5005ST is the IES-5005 splitter chassis with Telco-50 connectors.
- The MSC1000G (Management Switch Card) may be referred to as the switch card or MSC.
- The ALC1248G-51 and ALC1248G-53 (ADSL Line Card) may be referred to as the line card or ALC.
- The SLC1248G-22 (SHDSL Line Card) may be referred to as the line card or SLC.
- The VLC1224G-41 (VDSL Line Card) may be referred to as the line card or VLC.[1]

Related Documentation

- DSL Line Card User's Guides

  These user's guides provide hardware connection details and explain how to configure and manage the individual line cards.

- Management Switch Card User's Guide

  This user's guide provides hardware connection details and configuration and management instructions for the management switch card.

- Glossary and ZyXEL Web Site

  Please refer to www.zyxel.com for an online glossary of networking terms or the ZyXEL download library for additional support documentation.

1. The VLC1224G-41 is not available at the time of writing.

User Guide Feedback

Help us help you. E-mail all User Guide-related comments, questions or suggestions for improvement to techwriters@zyxel.com.tw or send regular mail to The Technical Writing Team, ZyXEL Communications Corp., 6 Innovation Road II, Science-Based Industrial Park, Hsinchu, 300, Taiwan. Thank you.

CHAPTER 1
System Description

This chapter describes the system features, specifications and applications of the IES-5000 series.

1.1 System Description

The IES-5000 series are IP-based DSLAMs (Internet Protocol Digital Subscriber Line Access Multiplexer) that connect DSL subscribers to the Internet. As a high-performance but yet compact and versatile platform, they can conveniently give telephone company central offices and Internet Service Providers (ISPs) the ability to deliver broadband Internet access to DSL subscribers.

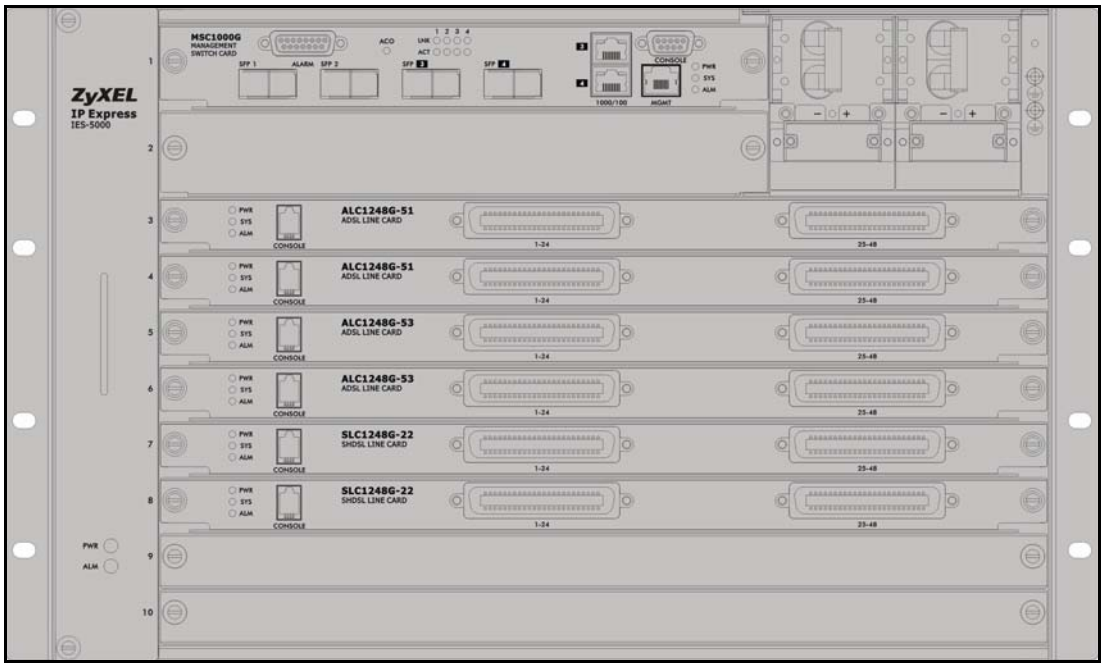
The IES-5000 platform allows for convenient management and support of various DSL technologies. The IES-5000M chassis can hold a maximum of eight line cards, so up to 384 DSL subscribers can simultaneously utilize a wide range of powerful broadband services. Additionally, the DSL line cards are hot swappable; thus, you do not need to interrupt the service of other cards to change or service an individual card. A single management switch card can provide the convenience of centralized network traffic supervision.

The IES-5000 also has dual, hot-swappable power modules that reduce the chance of system shutdown.

1.2 Front Panel

The following figures show the front panel of the IES-5000 main chassis with cards installed.

Figure 1 IES-5000M Front Panel



1.3 Features

The IES-5000 main chassis has slots for hot-swappable DSL line cards and management switch cards.

Backplane

Connect the hot swappable line cards and MSC cards to the backplane. The backplane is the inside rear panel of the IES-5000 main chassis.

Splitter Chassis

The IES-5000ST splitter chassis has slots for splitter and extension cards, and Telco-50 connectors for connecting to the subscribers and the PBX (Private Branch Exchange) or PSTN/ISDN (Public Switched Telephone Network/Integrated Services Digital Network) switch.

Hot Swappable DSL Line Cards

The IES-5000 uses hot swappable DSL line cards.

Hot Swappable Splitter Cards

The IES-5000ST uses hot swappable splitter cards.

Management Switch Card

The IES-5000 accommodates a management switch card that switches traffic and forwards it between the DSL line cards and other Ethernet switches.

Hot Swappable Fan Module

The IES-5000 is equipped with a hot swappable fan module with a filter to provide easy maintenance, greater reliability and increased system operating lifetimes.

Power Modules

The IES-5000 has dual, hot swappable power modules. One power module is redundant. The IES-5000 can be fully powered by just one power module so the system can keep running while you replace a power module.

Scalable Platform for Future Expansion

The flexible design of the IES-5000 allows service providers to start with minimum cost. As the number of users and applications increases, additional DSL line cards can be added to support more subscribers.

1.4 Applications

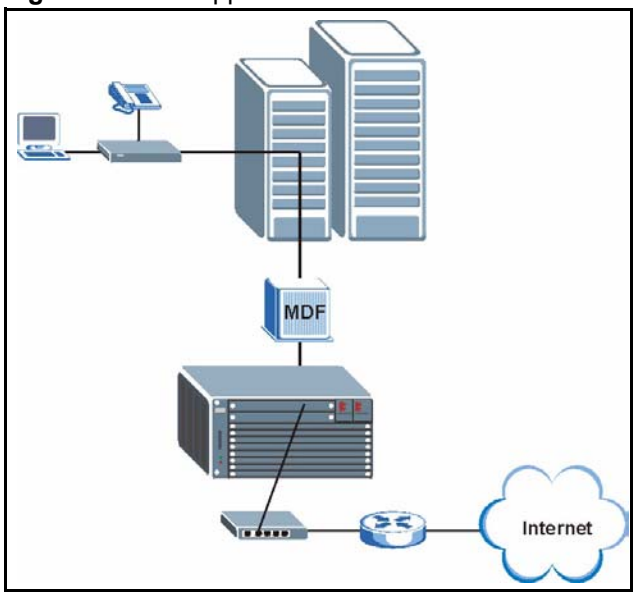
These are the main applications for the IES-5000:

- Internet access and multimedia services for Multiple Tenant Units (MTU).
- Other applications include video services, telemedicine, surveillance systems, remote servers systems, cellular base stations and high-quality videoconferencing.

1.4.1 MTU Application

The following diagram depicts a typical application of the IES-5000 with DSL modems, in a large residential building, or multiple tenant unit (MTU), that leverages existing phone line wiring to provide Internet access to all tenants. The MDF is the point of termination for the outside telephone company lines coming into a building and the telephone wiring in the building. Note that ADSL service can coexist with voice service on the same line.

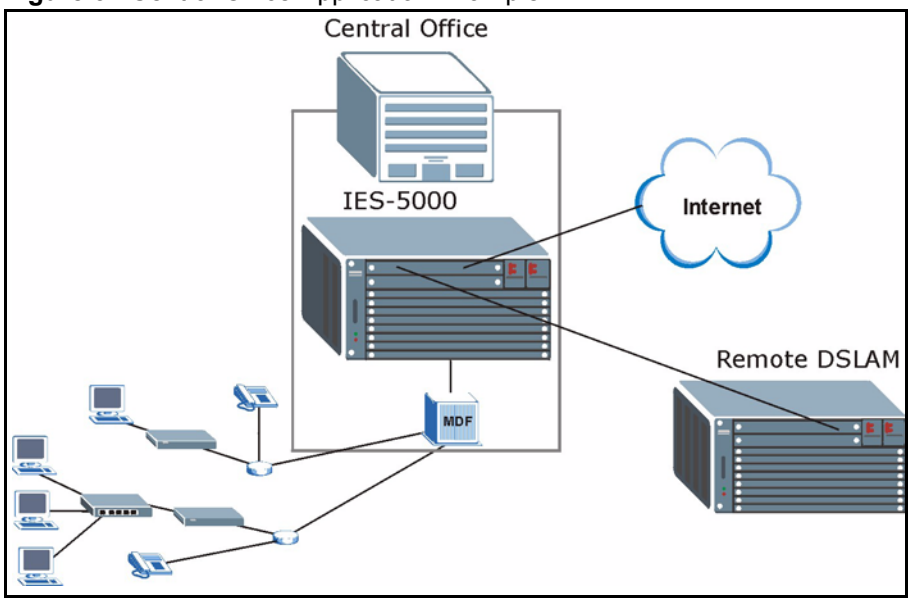
Figure 2 MTU Application



1.4.2 Central Office Application

The IES-5000 provides DSL service over telephone wires to subscribers. The following figure shows the IES-5000 setup in a telephone company's central office.

Figure 3 Central Office Application Example



CHAPTER 2
Unit Data

This chapter provides a detailed description of system specifications.

See the individual card User Guides for information on card features, settings and hardware.

2.1 Main Chassis Specifications

This section provides the specifications for the IES-5000.

2.1.1 Chassis Physical Specifications

The IES-5000 is 19 inch (482.6mm) rack-mountable.

See the following table for the number of slots in the main chassis as well as how many are for DSL line cards and how many are for management switch cards.

Table 1 Main Chassis Slots

NUMBER OF SLOTS:	TOTAL	FOR DSL LINE CARDS	FOR MSC
IES-5000M Chassis	10	8	2
IES-5005M Chassis	5	4	1

2.1.2 Chassis Dimensions and Weight

This table describes the IES-5000 main chassis dimensions and weight (including fan and power module weight; excluding card weights)

Table 2 Main Chassis Dimensions and Weights (Without Cards)

CHASSIS	DIMENSIONS	WEIGHT
IES-5000M Chassis	440 mm (W) x 250 mm (D) x 288.9 mm (H)	10.0 kg
IES-5005M Chassis	440 mm (W) x 250 mm (D) x 152 mm (H)	7.0 kg

This table describes the IES-5000 splitter chassis dimensions and weight (excluding card weights)

Table 3 Splitter Chassis Dimensions and Weights (Without Cards)

CHASSIS	DIMENSIONS	WEIGHT
IES-5000ST Chassis	440 mm (W) x 280 mm (D) x 240 mm (H)	10.4 kg
IES-5005ST Chassis	440 mm (W) x 280 mm (D) x 125 mm (H)	6.6 kg

2.1.3 Wire Gauge Specifications

This table describes the wire gauge specifications of the IES-5000.

Table 4 Wire Gauge Specifications

WIRE TYPE	REQUIRED AWG NO. (DIAMETER)
Ground Wire	12 or larger
Telephone Wire	26 or larger
Power Wire	12 or larger

AWG (American Wire Gauge) is a measurement system for wire that specifies its thickness. As the thickness of the wire increases, the AWG number decreases.

2.1.4 Power Specifications

This table describes the maximum power consumption of the IES-5000.

Table 5 Power Specifications

UNIT	CONSUMPTION IN WATTS	VOLTS DC	AMPS
IES-5000M Chassis	700	-48 to -60	20
IES-5005M Chassis	350	-36 to -72	10

Use a –48 VDC power source with 700 W minimum output for the IES-5000M or 350 W minimum output for the IES-5005M. See Section 2.3 on page 26 for more information.

2.1.5 Operating Environment

- Temperature: 0°C ~ 50°C
- Humidity: 5% - 95% (non-condensing)

2.1.6 Storage Environment

- Temperature: -40°C ~ 70°C

- Humidity: 5% - 95% (non-condensing)

2.2 Fan Module

This section provides details on the fan module.

2.2.1 Fan Physical Specifications

This table describes the fan module specifications of the IES-5000.

Table 6 Fan Module Specifications

UNIT	NUMBER OF FANS	FAN DIMENSIONS	UNIT DIMENSIONS
IES-5000 Fan Module	6	25.4 mm (W) x 92.0 mm (D) x 92.0 mm (H)	46.4 mm (W) x 237.0 mm (D) x 288.9 mm (H)
IES-5005 Fan Module	3 (1 large and 2 small)	Large: 120 mm (W) x 25 mm (D) x 120 mm (H) Small: 60 mm (W) x 20 mm (D) x 60 mm (H)	46.4 mm (W) x 255 mm (D) x 153 mm (H)

The fan module contains a removable filter screen for access to the fans and to clean or replace the filter.

2.2.2 Fan Mechanical Operation:

- Safe design: All fans have rotor-locking protection to prevent damage to wiring and electrical components. The fan rotors will lock when fan movement is physically obstructed.
- Locked rotor protection: No damage will occur when the fan rotors are locked for 72 continuous hours. After this amount of time, damage to the fans may occur. The fans will automatically restart as soon as the physical obstruction is removed.
- Polarity protection: A reverse-polarity voltage connection will not cause damage. After the polarity is corrected, the fan will restart automatically.
- Insulation resistance: There should be more than 10M ohms of resistance between the housing and the terminal at 500 V.D.C.

2.2.3 Fan Fuse Ratings

This table describes the fan fuse ratings of the IES-5000.

Table 7 Fan Fuse Ratings

UNIT	NUMBER OF FUSES	TYPE	AMPS	VOLTS AC	DIMENSIONS
IES-5000 Fan Module	1	T	2	250	5mm (D) x 20mm (L)
IES-5005 Fan Module	1	T	1	250	5mm (D) x 20mm (L)

2.3 Power Modules

These sections provide details on the power modules.

Table 8 Power Fuse Ratings

UNIT	NUMBER OF FUSES	TYPE	AMPS	VOLTS AC	DIMENSIONS
IES-5000 Power Module	2	T	20	250	6mm (D) x 30mm (L)
IES-5005 Power Module	2	T	8	250	5mm (D) x 20mm (L)

2.3.1 IES-5000M Power Supply Module Details

- Two 300V/20A 10mm terminal blocks with dual inputs
- Built in surge protection
- Rated Voltage -48.0 VDC
- Operating Voltage: -48 ~ -60 VDC
- Maximum power consumption: 700 W

2.3.2 IES-5005M Power Supply Module Details

- Two 300V/20A 10mm terminal blocks with dual inputs
- Rated Voltage -48.0 VDC
- Operating Voltage: -36 to -72 VDC
- Maximum power consumption: 350 W

CHAPTER 34
Hardware Installation and Connections

This chapter describes how to install and connect the IES-5000 chassis and cards.

3.1 General Installation Instructions

Perform the installation as follows:

- Make sure the IES-5000 power switches are in the **OFF** position.
- Install the chassis as detailed in this chapter. Make sure you connect the frame grounds before you make any other connections.
- If chassis cards are not already installed, follow the procedure in the next section to install them.
- Refer to Section 3.5 on page 39 for instructions on making connections with Telco-50 connectors.
- Refer to Section 3.6 on page 46 for instructions on making power connections and turning on the IES-5000.

3.2 Chassis Installation

This section explains how to install the chassis.

3.2.1 Rack-mounted Installation Requirements

Make sure the rack will safely support the combined weight of all the equipment it contains.

Note: Make sure the position of the IES-5000 does not make the rack unstable or top-heavy. Take all necessary precautions to anchor the rack securely before installing the unit.

- Use a #2 Phillips screwdriver to install the screws.
- Refer to Section 2.1.3 on page 24 for the gauge of wire to use for the frame ground connections.
- Refer to Chapter 2 on page 23 for the IES-5000 chassis' dimensions, weights and power consumption.

Note: Failure to use the proper screws may damage the unit.

3.2.2 Mounting the IES-5000 Chassis on a Rack

- Make sure that nothing obstructs the airflow of the chassis.
- If you are facing the IES-5000 chassis front panel, the fan exhaust vents are located on the right side panel of the unit and the fans along with the intake vents are located on the left side panel.

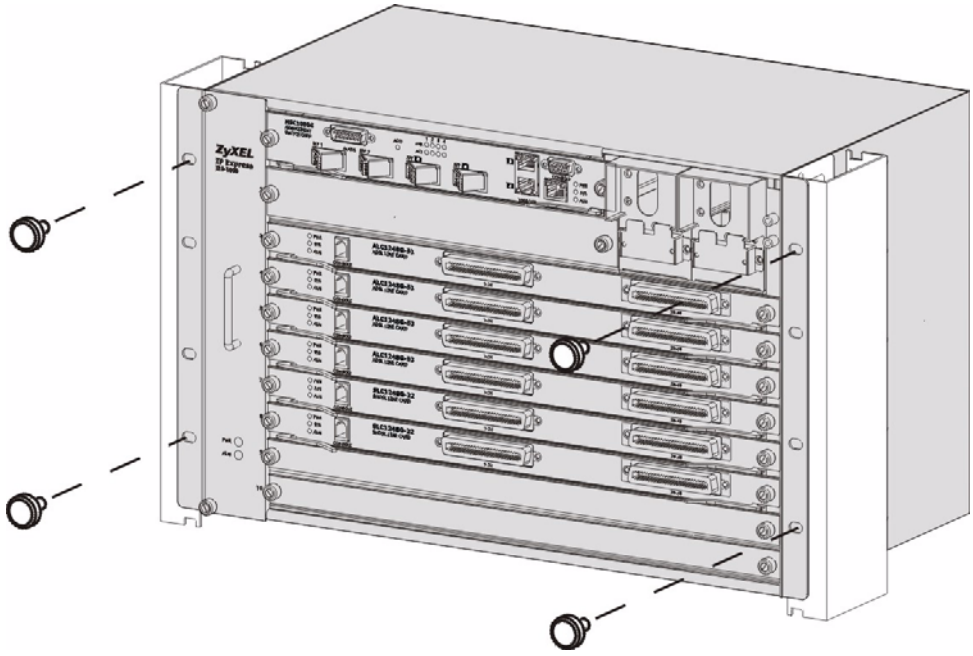
Figure 4 Chassis Airflow

Use the following procedure to install the chassis in the rack.

Note: Install the main chassis and splitter chassis in a rack with the splitter chassis directly below the main chassis.

1. Position a mounting bracket (that is already attached to the chassis) on one side of the rack, lining up the screw holes on the bracket with the screw holes on the side of the rack.
2. Use the screwdriver to install the screws through the mounting bracket holes into the rack.
3. Repeat Step 1 and Step 2 to attach the second mounting bracket on the other side of the rack.

Figure 5 Rack Mounting the Chassis



3.2.3 Connecting the Frame Ground

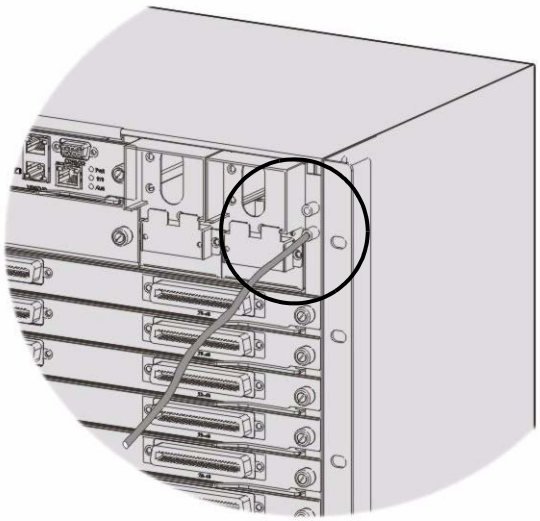
Refer to Section 2.1.3 on page 24 for the ground wire gauge.

- The IES-5000 chassis frame ground is on the upper right corner of the front panel.
- Connect the frame grounds to a building's protective earthing terminals using a green-and-yellow frame ground wire.

Note: Warning!

Connect the frame ground before you connect any other cables or wiring.

Figure 6 Chassis Frame Ground



3.3 Card Installation

This section shows you how to install and remove chassis cards.

- Install the line cards in the IES-5000 starting from slot 3 downwards.
- Install the line cards in the IES-5005 starting from slot 2 downwards.
- Install management switch cards in slot 1 and/or 2 on the IES-5000.
- Install a management switch card in slot 1 on the IES-5005.

3.3.1 Installing MSC and Line Cards

Use the following procedure to install management switch cards and DSL line cards in the chassis.

1. Grasp the center of the front panel of the card with one hand and place the other hand under the card to support it.
2. Insert the card halfway into the slot and spread the two ejector levers outward. Make sure the ejector levers are perpendicular to the front panel.
3. Slide the card into the slot until it makes contact with the backplane. The ejector levers should be at a small angle to the front panel now.
4. Push the two ejector levers firmly until they are flush with the front panel.
5. Tighten the two thumbscrews.

Figure 7 Installing a Card

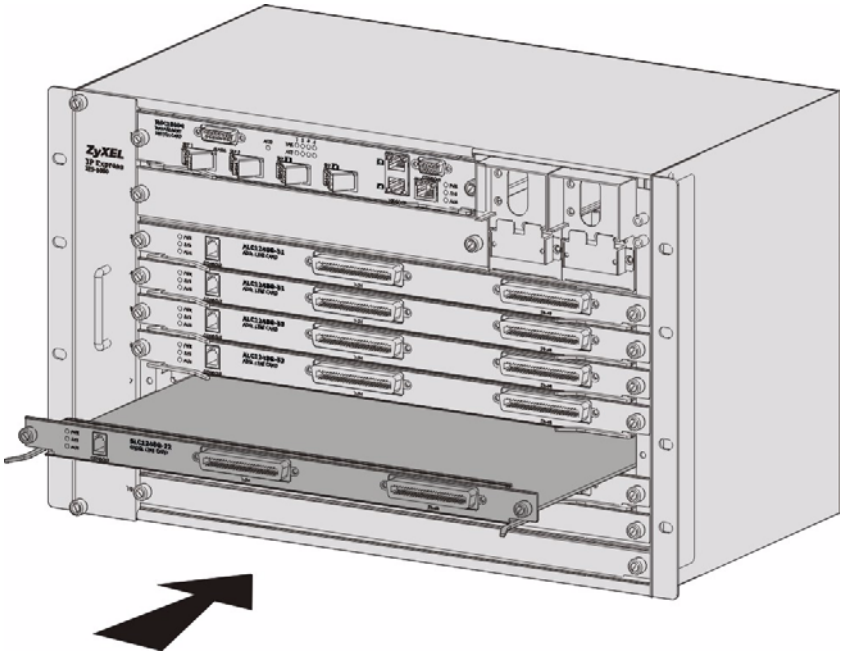


Figure 8 Closing the Ejector Levers

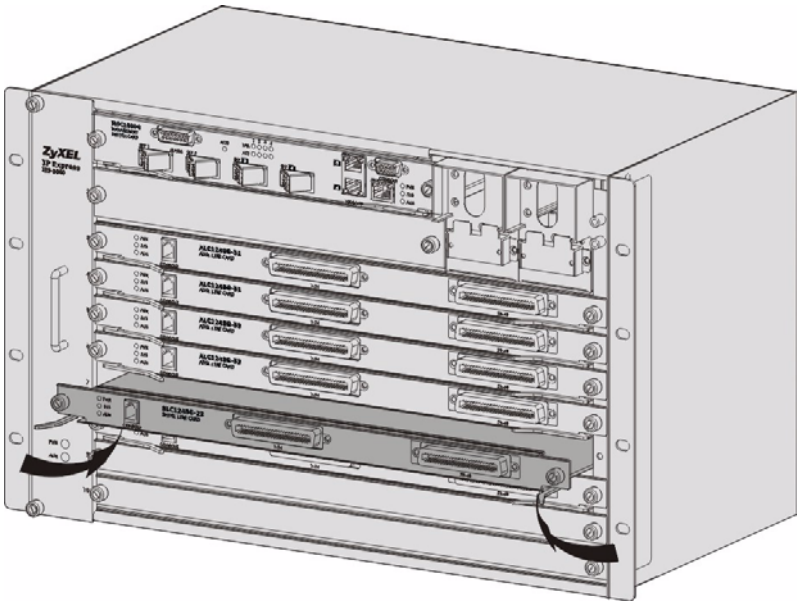
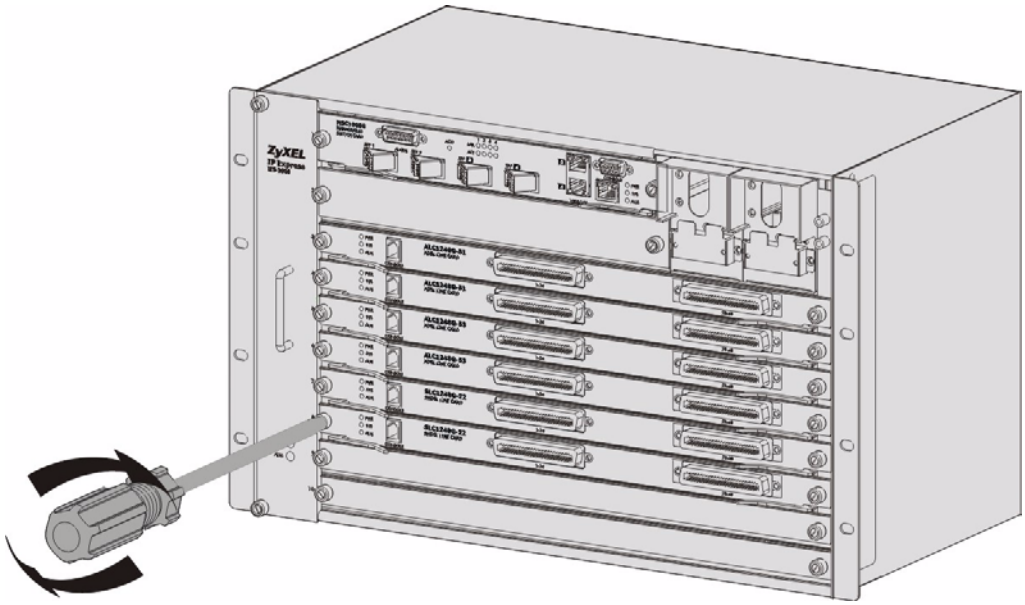


Figure 9 Tightening Card Thumbscrews



3.3.2 Removing MSC and Line Cards

1. Disconnect all cables from the card.
2. Loosen the two thumbscrews.
3. Pull the two ejector levers firmly until the front of the card is clear of the chassis. Pull the ejector levers until they are perpendicular to the front panel.
4. Grasp the center of the front panel of the card with one hand and place the other hand under the card to support it.
5. Slide the card out of the slot.

Figure 10 Loosening Card Thumbscrews

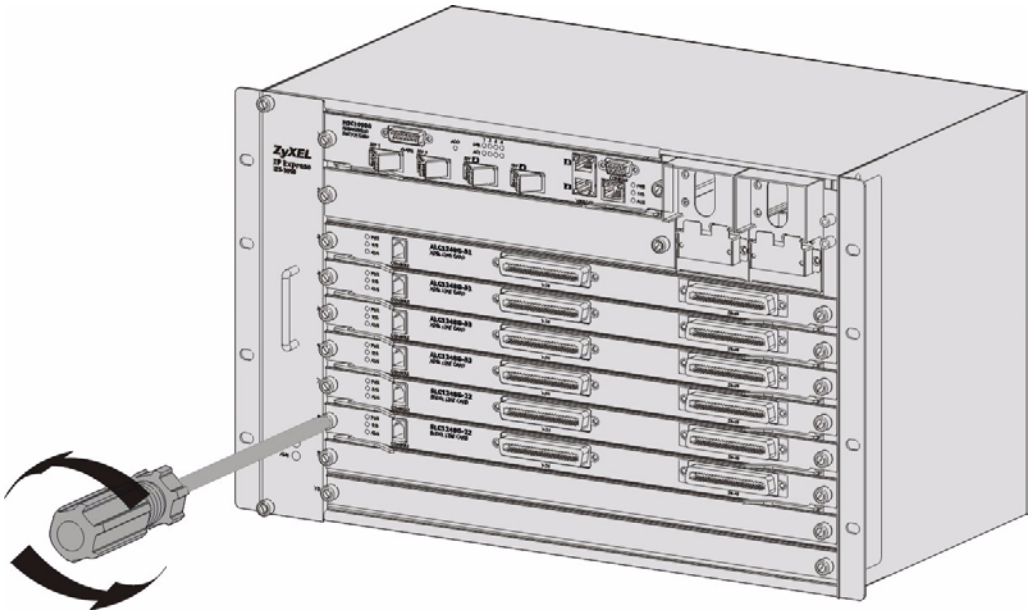


Figure 11 Opening the Ejector Levers

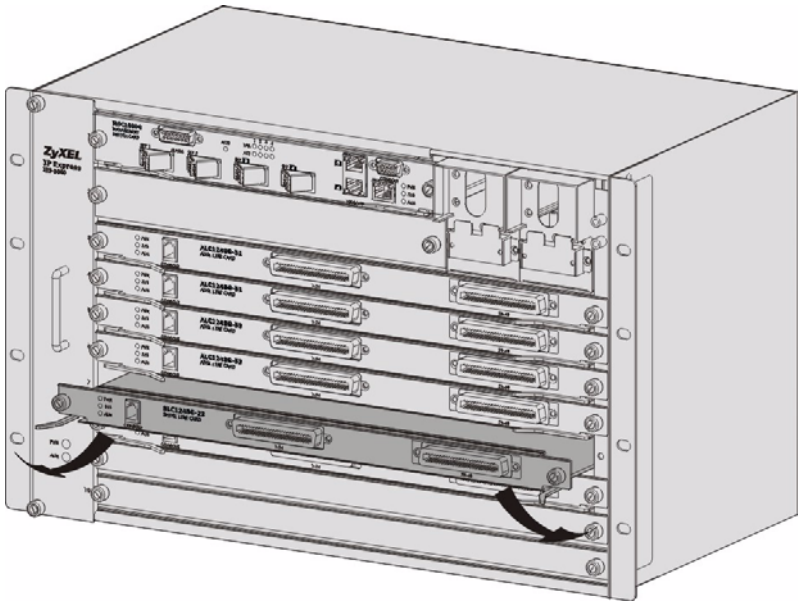
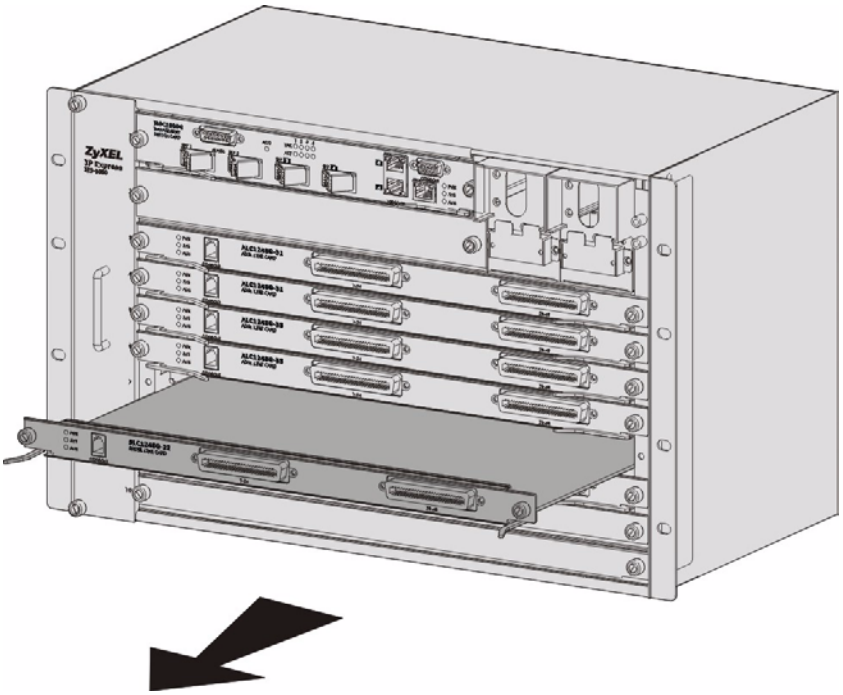


Figure 12 Removing a Main Chassis Card



3.3.3 Installing a Splitter Chassis Card

The splitter card's type and slot number must match those of the DSL line card to which it is to connect. For example, install ASC1024 cards in slots 3-1 and 3-2 of the splitter chassis if there is an ALC1248G line card in slot 3 of the main chassis. Leave the slot covers on unused splitter slots.

Use the following procedure to install a splitter card in the splitter chassis.

1. Install the splitter cards in the splitter chassis slots that correspond to the slot number of the line card in the main chassis (a management switch card does not need a splitter chassis card).
2. Grasp the center of the front panel of the card with one hand and place the other hand under the card to support it.
3. Insert the card into the slot and push it in until the front panel of the card is flush with the front panel of the splitter chassis.
4. Tighten the two thumbscrews.

Figure 13 Installing a Splitter Chassis Card

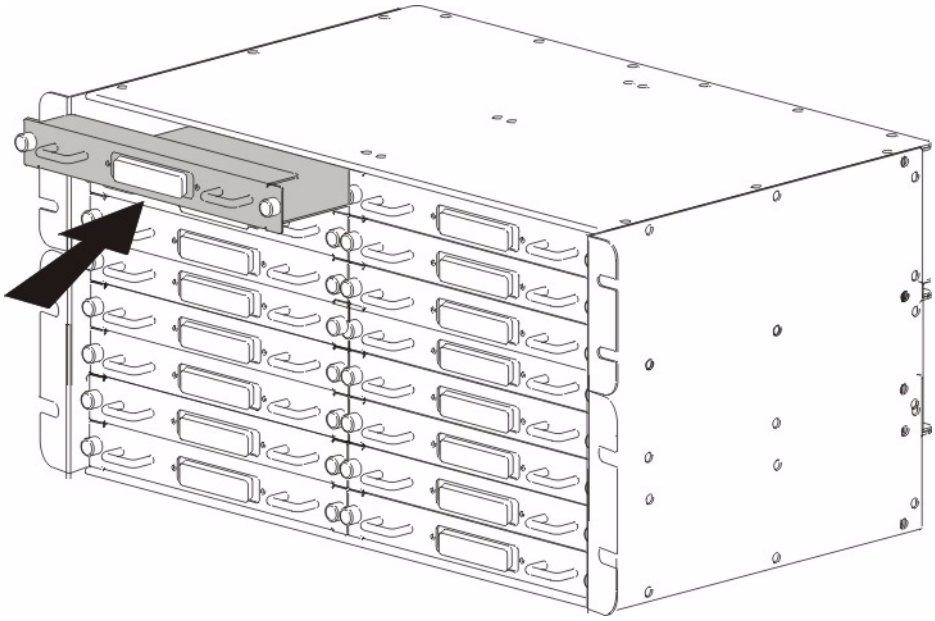
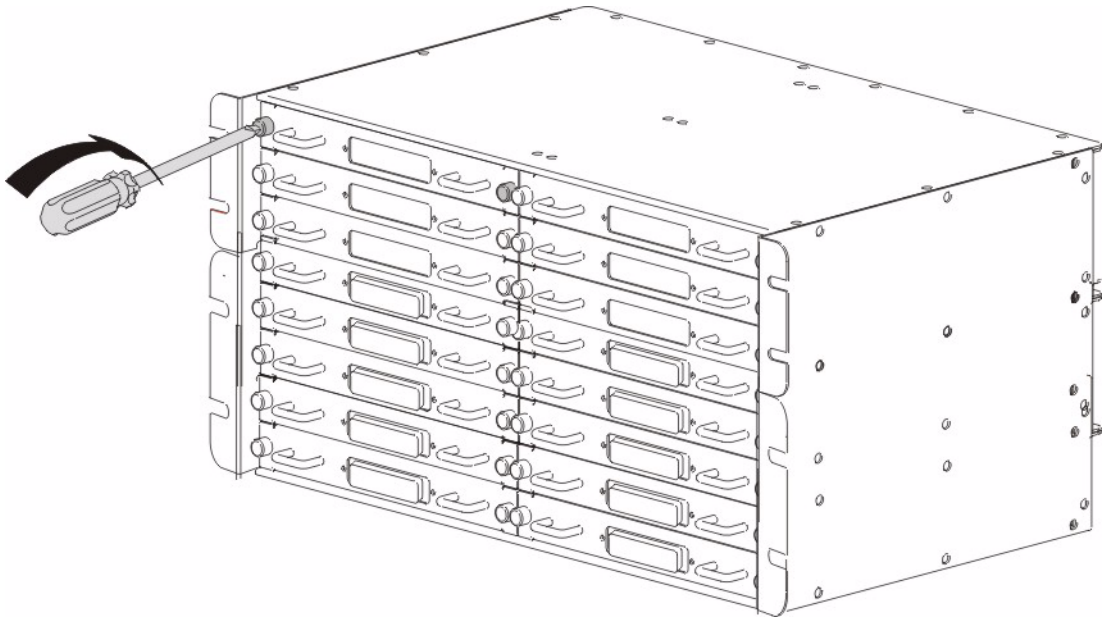


Figure 14 Tightening Splitter Chassis Card Thumbscrews



3.3.4 Removing a Splitter Chassis Card

Use the following procedure to remove a splitter card from the splitter chassis.

1. Disconnect the cable from the card.
2. Loosen the two thumbscrews.

3 Grasp the handles on the front panel of the card and start to pull the card out.

4 After you have the card partially out of the chassis, place one hand under the card to support it.

5 Slide the card out of the slot.

Figure 15 Loosening Splitter Chassis Card Thumbscrews

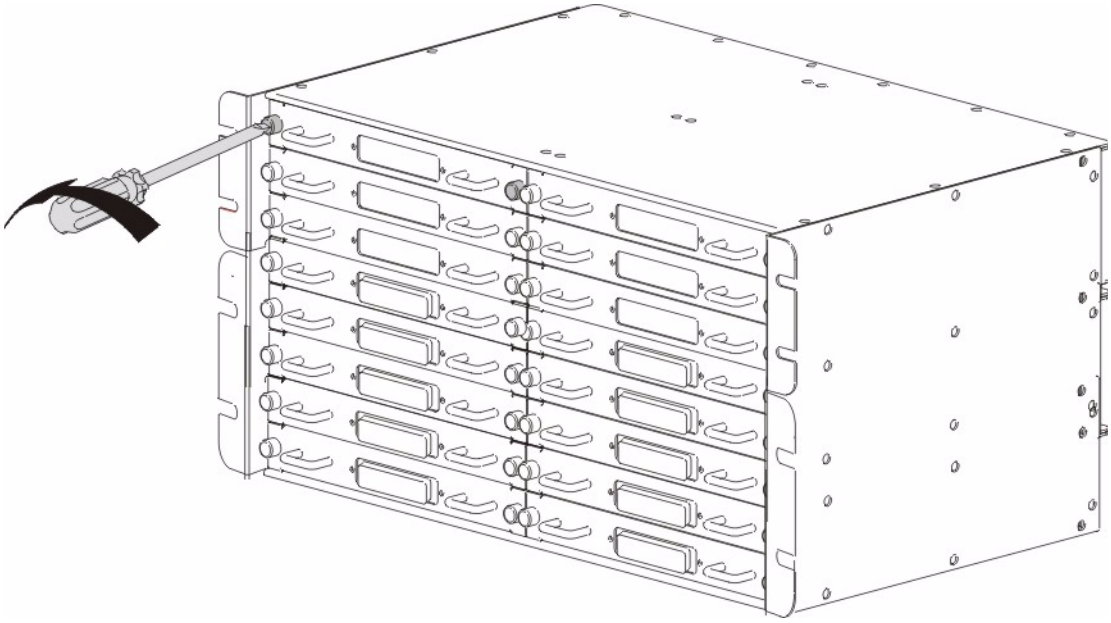
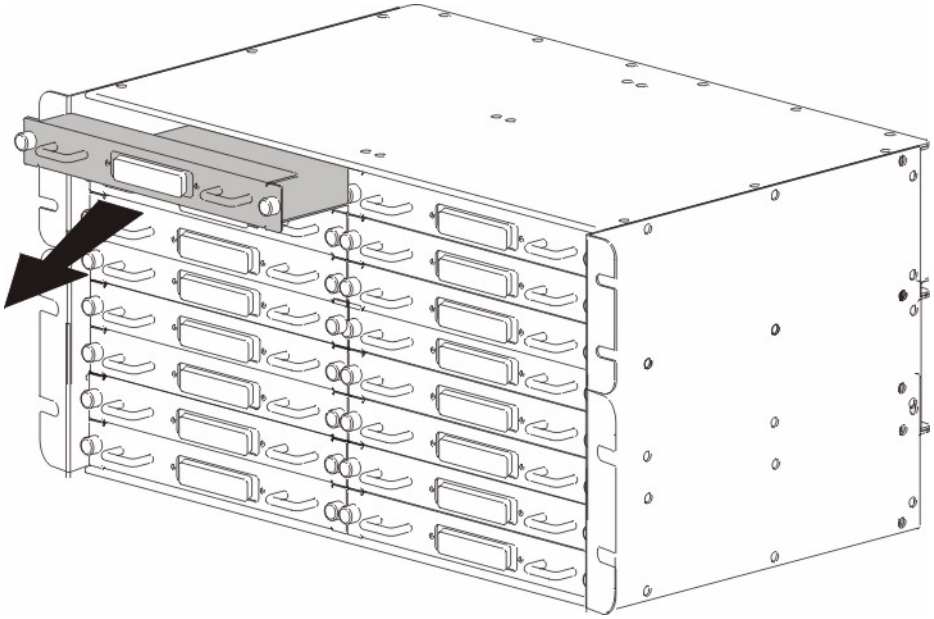


Figure 16 Removing a Splitter Chassis Card



3.4 Making Card Connections

The following describes how to connect the DSL line cards to the splitter chassis cards. For the management switch card, refer to the card's User's Guide for instructions on making the connections.

3.4.1 DSL Line Card Connections

Use a Telco-50 cable to connect the DSL line card's front panel Telco-50 connector to the corresponding splitter card's front panel Telco-50 connector. Make sure that you use the appropriate length Telco-50 cables with the DSL line cards; using cables of the wrong length blocks access to other cards. See the specifications appendix for the lengths of ZyXEL's optional Telco-50 cables.

Use a long Telco-50 cable to connect a line card's **1-24** Telco-50 connector to the Telco-50 connector on the corresponding splitter card in the left column (labeled x-1) of the splitter chassis.

Use a short Telco-50 cable to connect a line card's **25-48** Telco-50 connector to the Telco-50 connector on the corresponding splitter card in the right column (labeled x-2) of the splitter chassis.

Figure 17 IES-5000 Front Panel Telco-50 Connections (with 6 Line Cards)

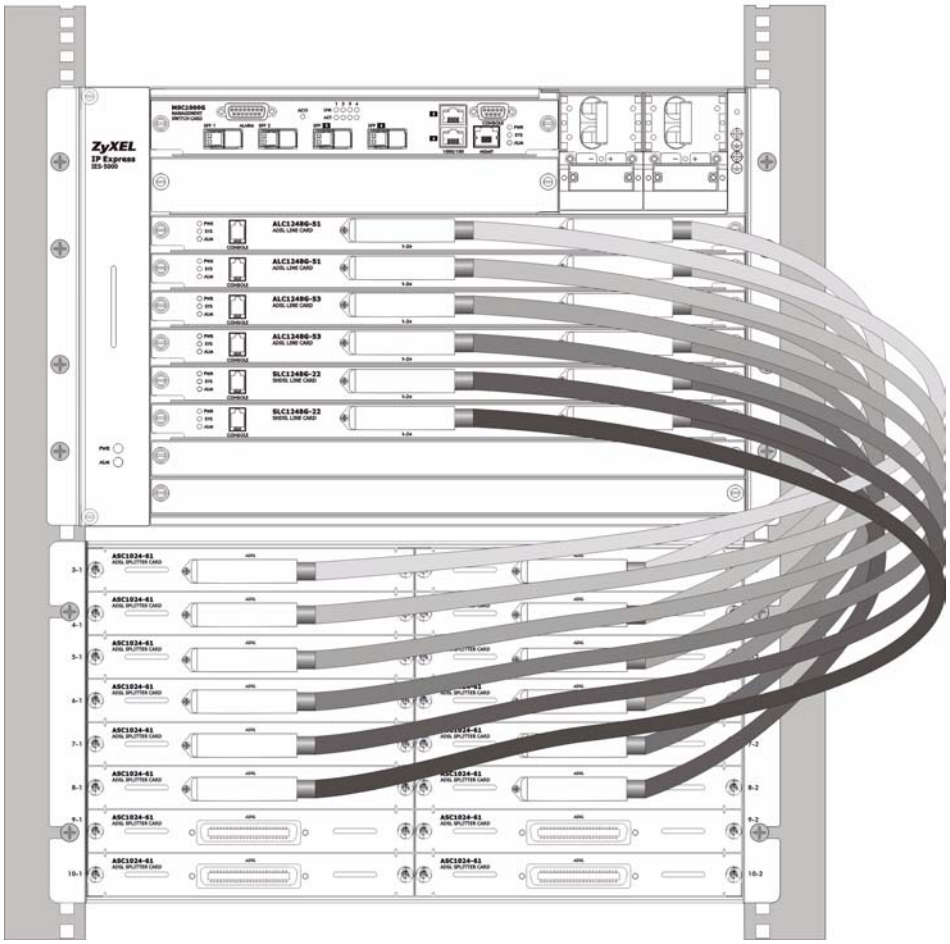
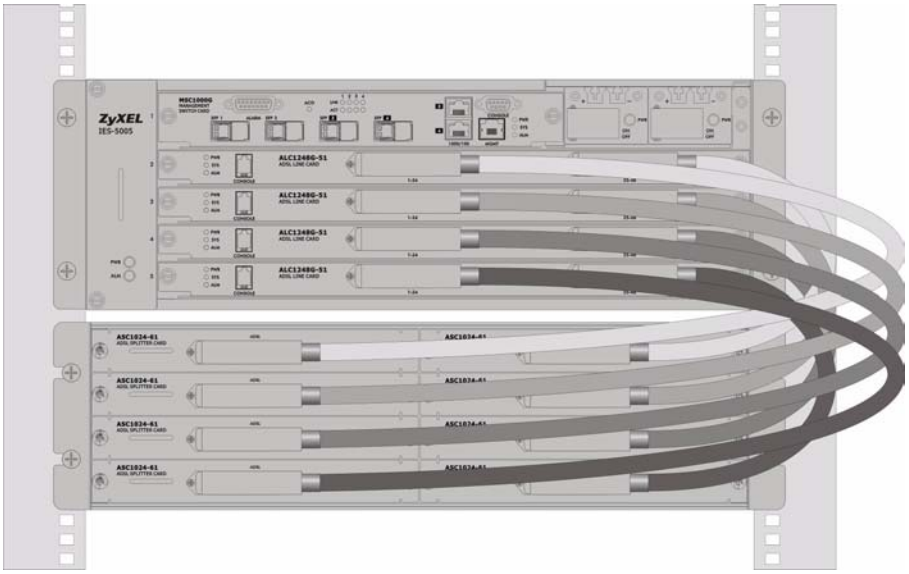


Figure 18 IES-5005 Front Panel Telco-50 Connections (with 4 Line Cards)



3.5 MDF Connections

This section shows you how to connect the IES-5000 splitter chassis to a Main Distribution Frame.

3.5.1 MDF Connections Overview

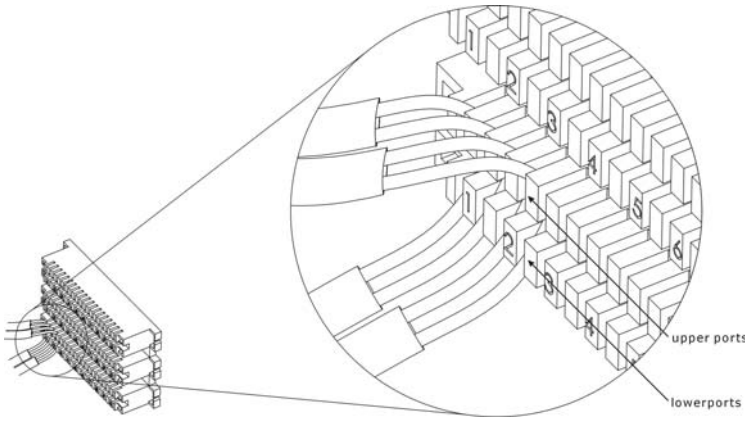
Observe the following before you start:

- Refer to Section 2.1.3 on page 24 for the gauge of telephone wire to use.
- Follow the pin assignments shown in the line card User's Guide to wire Telco-50 cables to Telco-50 connectors.

3.5.2 MDF (Main Distribution Frame)

An MDF is usually installed between subscribers' equipment and the telephone company (CO) in a basement or telephone room. The MDF is the point of termination for the outside telephone company lines coming into a building and the telephone wiring in the building.

Figure 19 MDF (Main Distribution Frame) Wiring



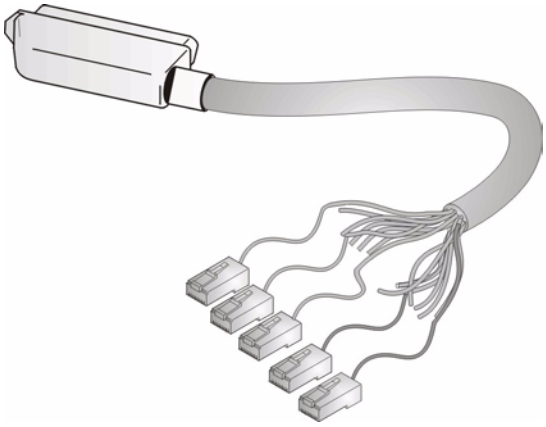
- Connect wiring to end-user equipment to the lower ports of an MDF and connect wiring from the telephone company to the upper ports of an MDF (see the previous figure).
- Some MDFs have surge protection circuitry built in between the two banks; thus, do not connect telephone wires from the telephone company directly to your IES-5000.
- Use a punch-down tool to seat telephone lines into MDF blocks.

3.5.3 Telco-50 Cables

Telco-50 cables are used for data and voice applications with MDFs (Main Distribution Frame), patch panels and distribution boxes. They can also be used as extension cables. Telco-50 cables are made up of 25 twisted-pair copper wires.

Connect a Telco-50 connector to one end of the cable (see Section 3.5.3 on page 39 for pin assignments) and connect the other end directly to an MDF; alternatively attach RJ-11 connectors and connect directly to DSL modem(s).

Figure 20 Telco-50 Cable with RJ-11 Connectors



3.5.4 Splitter Chassis Rear Panel Connections

A DSL splitter card separates the voice signal from the DSL signal. It feeds the DSL signals to the DSL line card and diverts the voice signal to the **CO** Telco-50 connector (or wire wrapping pins) on the splitter chassis' rear.

Connect the **CO** Telco-50 connectors to the PBX or PSTN/ISDN switch when using the ADSL splitter card.

Connect the **USER** Telco-50 connectors to the subscribers' telephone wiring. In most multi-tenant unit applications, the **USER** pins connect to the subscribers' telephone wiring via Main Distribution Frame (MDF).

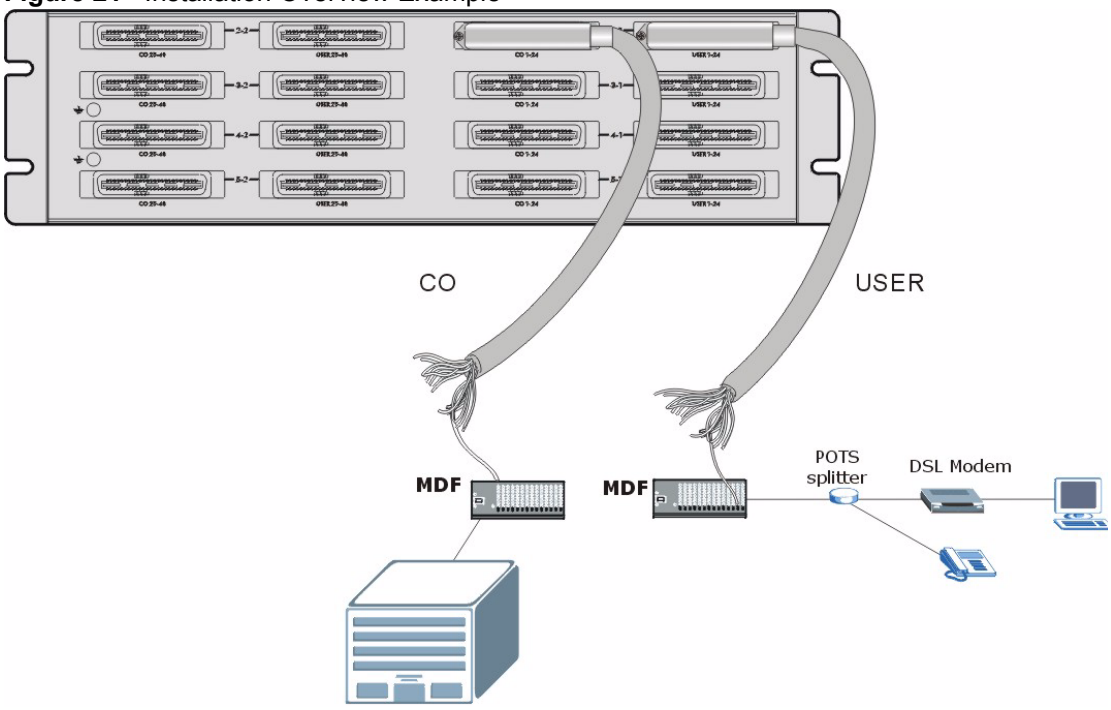
See Section 3.5.5 on page 40 for example splitter chassis rear panel connections.

3.5.5 MDF Connections

The following figure gives an overview on a possible installation scenario for the IES-5000 using the DSL line cards and splitter cards. Data and voice signals can coexist on the same telephone wiring.

Note: Multiple upper and lower MDF port connections are shown as one line in the following figure.

Figure 21 Installation Overview Example



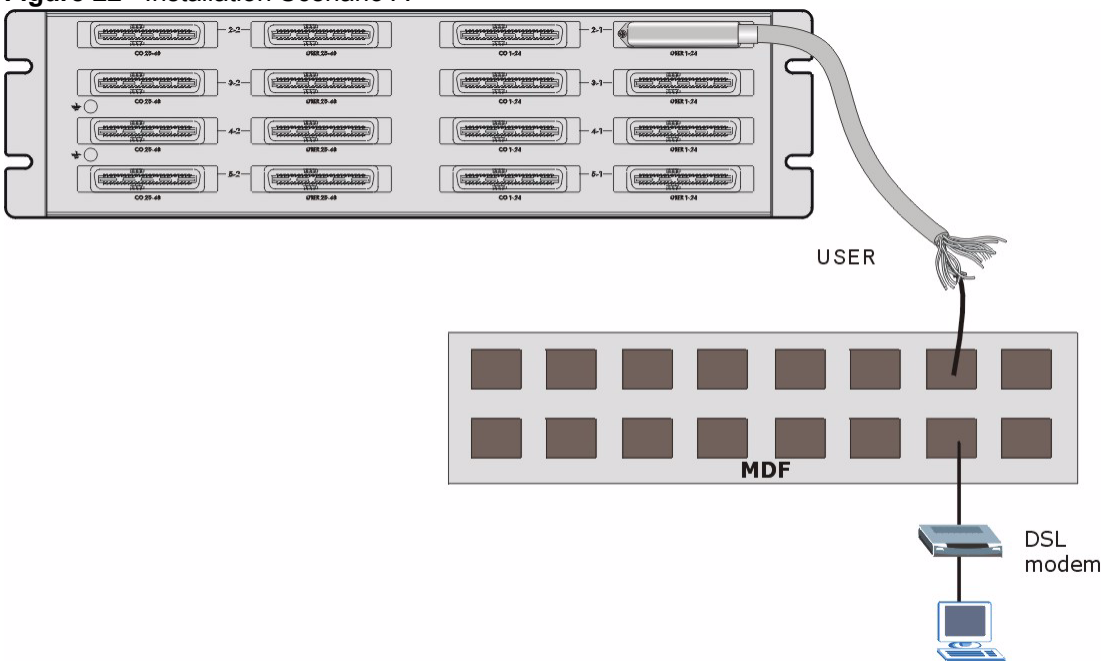
You can also attach RJ-11 connectors to the Telco-50 cable and connect directly to a DSL modem(s) or patch panel. This chapter discusses connections using MDFs. The following sections describe typical installation scenarios.

3.5.5.1 MDF Installation Scenario A

You want to install the IES-5000 in an environment where there are no previously installed MDFs. There is no phone service and you want to install the IES-5000 for data-access only. No connection from the Telco-50 CO connector is necessary. G.SHDSL connections carry data only, thus they are best suited to this installation scenario.

You may connect using an MDF or attach RJ-11 connectors to the non-IES-5000 end of the Telco-50 cable and then connect to DSL modems directly.

Figure 22 Installation Scenario A



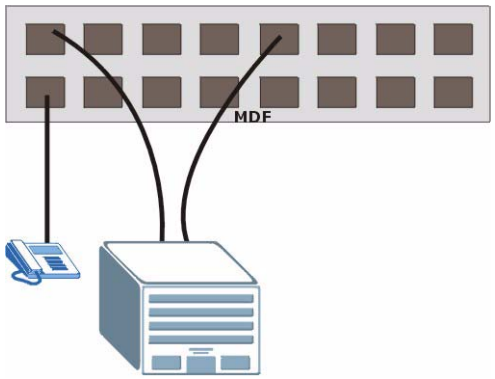
Use the following procedure for this MDF installation scenario.

1. Connect the Telco-50 connector end of the cable to the Telco-50 connector labeled **USER**.
2. Connect the wiring on the other end of the Telco-50 cable to the upper ports of the MDF using a punch-down tool.
3. Connect the telephone wiring from each end-user's DSL modem to the lower ports of the MDF.

3.5.5.2 Installation Scenario B

Phone service is available. There is one MDF from which end-users CO connections are made (see next figure). This installation scenario does not apply to G.SHDSL connections.

Figure 23 One MDF for End-user and CO Connections

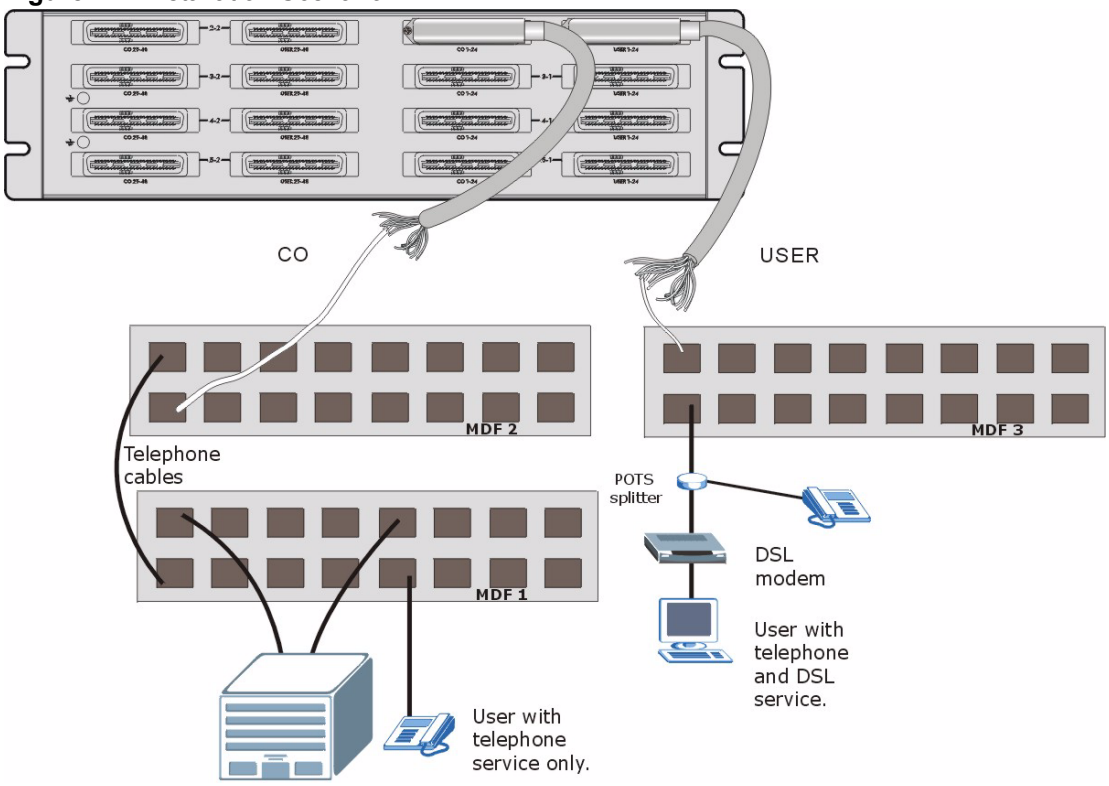


This installation scenario requires three MDFs. Please refer to the following figure for the connection schema.

- MDF 1 is the original MDF used for telephone connections only.
- MDF 2 is used for telephone connections only.
- MDF 3 is for DSL service connections.

Note: Change the wiring from MDF 1 to MDF 3 for telephone subscribers who want DSL service.

Figure 24 Installation Scenario B



Use the following procedure for this MDF installation scenario.

1. Connect the Telco-50 connector end of the cable you want for DSL service to the Telco-50 connector labeled **USER** on the splitter chassis rear panel.
2. Connect the wiring on the other side of the Telco-50 cable to the upper ports of MDF 3 using a punch-down tool.
3. Connect the telephone wiring from the end-user's DSL modem(s) to the lower ports of MDF 3.
4. Connect the Telco-50 connector end of the cable you want for phone service to the Telco-50 connector labeled **CO** on the splitter chassis rear panel.
5. Connect the wiring on the other side of the Telco-50 cable to the lower ports of MDF 2 using a punch-down tool.

6 Connect the upper ports of MDF 2 to the lower ports of MDF 1 using telephone wires.

7 Connect the upper ports of MDF 1 to the telephone company.

8 Telephone subscribers only (non-DSL subscribers) retain connections to the lower ports of MDF 1.

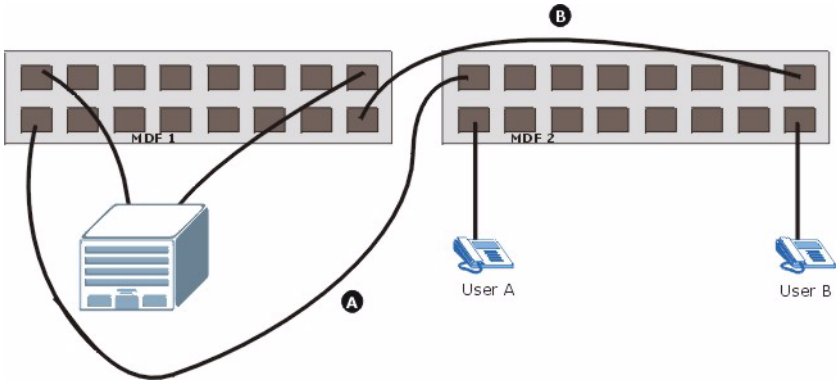
9 Change the wiring from MDF 1 to MDF 3 for telephone subscribers who want DSL service.

3.5.5.3 Installation Scenario C

Phone service is also available but there are two MDFs; one for end-user telephone line connections and the other one for CO telephone wiring connections (see the following figure). This installation scenario does not apply to G.SHDSL connections.

Note: Users A and B have telephone (only) service.

Figure 25 Two Separate MDFs for End-user and CO Connections

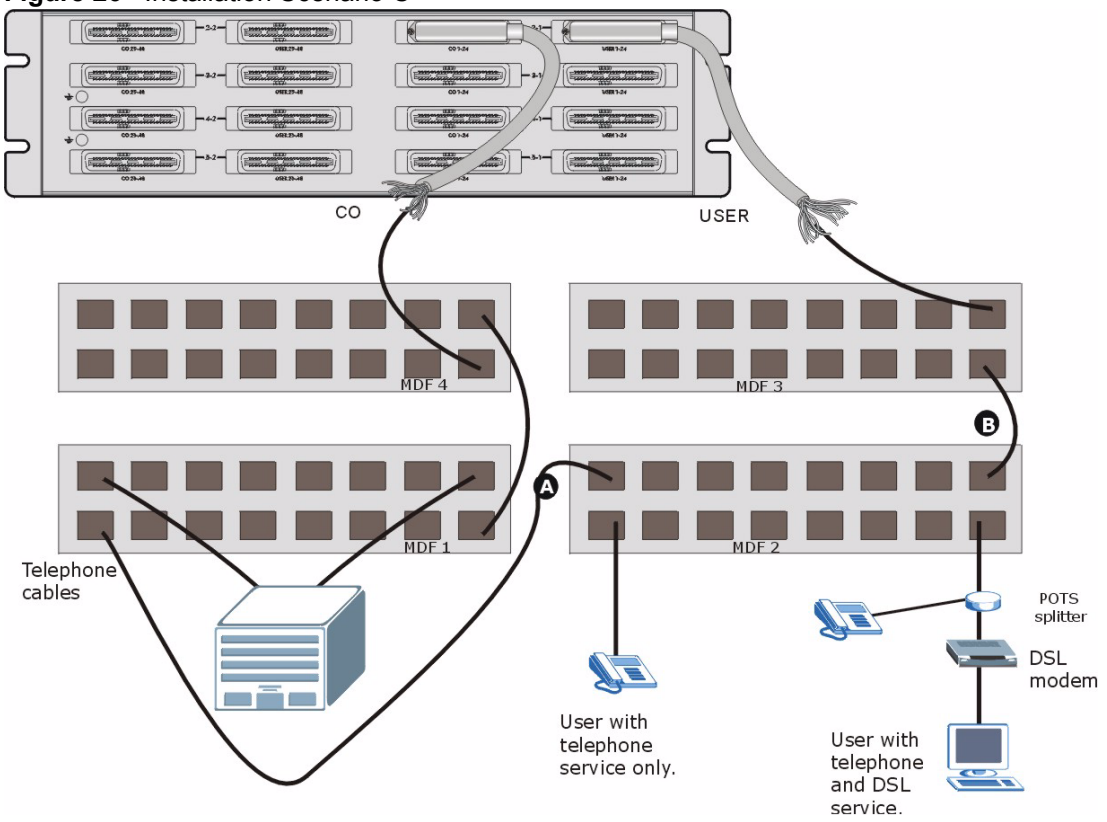


This installation scenario requires four MDFs. Please refer to the following figure for the DSL connection schema.

- MDFs 1 and 2 are the two original MDFs.
- MDFs 3 and 4 are two additional MDFs you need.

Note: User A still has telephone service only. User B now has telephone and DSL service (see the following figure)

Figure 26 Installation Scenario C



Use the following procedure for this MDF installation scenario.

1. Connect the Telco-50 connector end of the cable you want for DSL service to the Telco-50 connector labeled **USER** on the splitter chassis rear panel.
2. Connect the wiring on the other side of the Telco-50 cable to the upper ports of MDF 3 using a punch-down tool.
3. Connect the lower ports of MDF 3 to the upper ports of MDF 2 for those users that want DSL service. (Users who want telephone service only, retain the original connection from the top port of MDF 2 to the bottom port of MDF 1.)
4. Connect the telephone wiring from the end-user's DSL equipment to the lower ports of MDF 2.
5. Connect the Telco-50 connector end of the cable you want for phone service to the Telco-50 connector labeled CO on the splitter chassis rear panel.
6. Connect the wiring on the other side of the Telco-50 cable to the lower ports of MDF 4 using a punch-down tool.
7. Connect the top ports of MDF 4 to the bottom ports of MDF 1 using telephone wires.
8. Connect the top ports of MDF 1 to the telephone company.

3.6 Power Connections

This section shows you how to connect the IES-5000 to a power source.

Use the following procedures to connect the IES-5000 to a power source after you have installed the chassis in a rack.

Note: Refer to Section 2.1.4 on page 24 for power requirements and make sure you are using an appropriate power source.

Observe the following before you start:

- Refer to Section 2.1.3 on page 24 for the gauge of wire to use for the IES-5000 power connections.
- Keep the IES-5000 power switches in the **OFF** position until you come to procedure for turning on the power.
- Keep the power supply switch in the **OFF** position until you come to procedure for turning on the power.

Note: Use only power wires of the required diameter for connecting the IES-5000 to a power supply (refer to Section 2.1.3 on page 24 for the required wire gauge).

3.6.1 Power Connections

The main chassis uses two power supply modules. These modules are hot-swappable and supply power to the chassis cards.

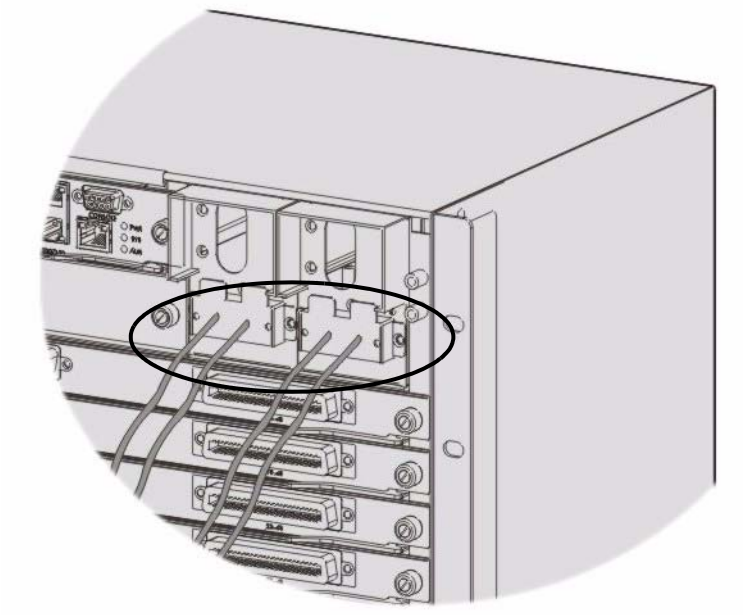
The power connections are at the upper-right corner of the front panel of the chassis.

3.6.1.1 Procedure to Connect the Power

Note: When installing the IES-5000 power wires, push the wires firmly into the terminals as deep as possible and make sure that no exposed (bare) wires can be seen or touched.

1. Connect one end of a power wire to one of the –48V power terminals on the front panel of your IES-5000 and tighten the terminal screw.
2. Connect the other end of the power wire to the –48V terminal on the power supply.
3. Repeat the previous step for the second power supply module.

Figure 27 Connecting IES-5000 Power



3.6.2 Procedure to Turn on the IES-5000 Power

1. Turn on the power supply.
2. Move the power switches on both power modules to the **ON** position.

CHAPTER 4
Maintenance and Troubleshooting

This chapter describes how to troubleshoot and maintain the system.

4.1 Fan Maintenance

This section describes how to change a fan fuse or a fan module on the IES-5000.

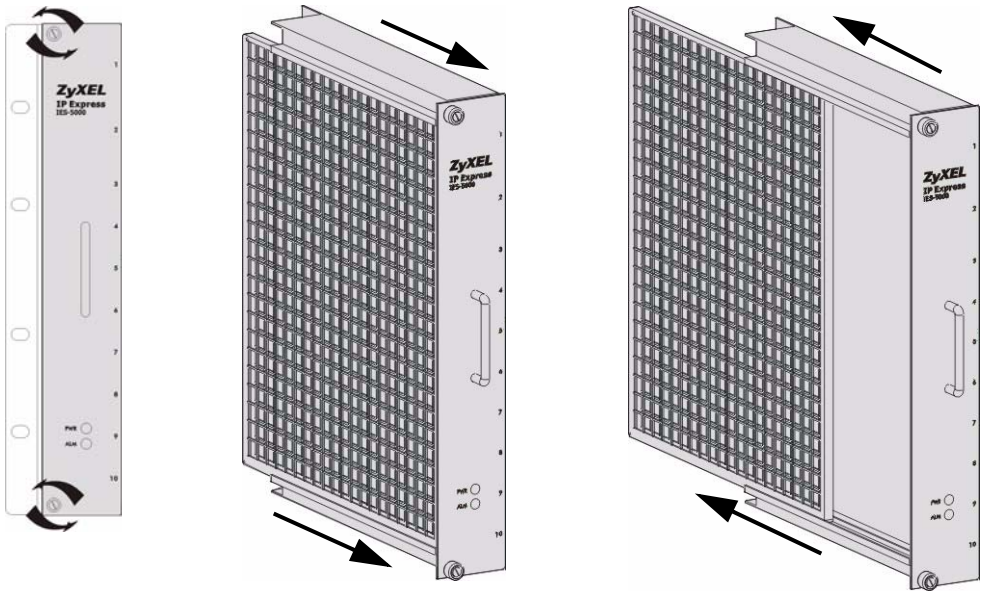
4.1.1 Procedure to Remove and Install the Fan Module

The main chassis has a hot-swappable fan module. The fan module is at the left on the front panel. Replace the entire fan module if the fuse is not the problem. Return any malfunctioning fan modules to the manufacturer.

Perform the following procedure to remove the fan module in order to clean the fan filter, change a fan fuse or the fan module.

1. Loosen the thumbscrews on the front of the fan module.
2. Slide out the fan module.
3. Replace the fuse if it is burnt out (see Section 2.2.3 on page 25 for fuse information). If the fuse is not the problem, use a different fan module from the manufacturer.
4. Slide out the fan filter. Clean or replace the filter.
5. Slide the fan filter back into the fan module.
6. Slide the fan module back into the fan module slot.
7. Tighten the thumbscrews.

Figure 28 IES-5000 Fan Module Thumbscrews



4.2 Power Maintenance

This section describes how to change the power modules.

4.2.1 Procedure to Disconnect the Power

The power modules are hot swappable and can be disconnected from the power supply individually.

1. Make sure that the power module you want to disconnect has the power switch in the **OFF** position.
2. Turn off the power supply.
3. Disconnect the power wires from the power supply's power terminals.
4. Disconnect the power wires from the IES-5000 power module terminals.

4.2.2 Procedure to Change a Power Module

The power modules are at the upper-right corner of the front panel of the chassis. Use the following procedure to change a power module.

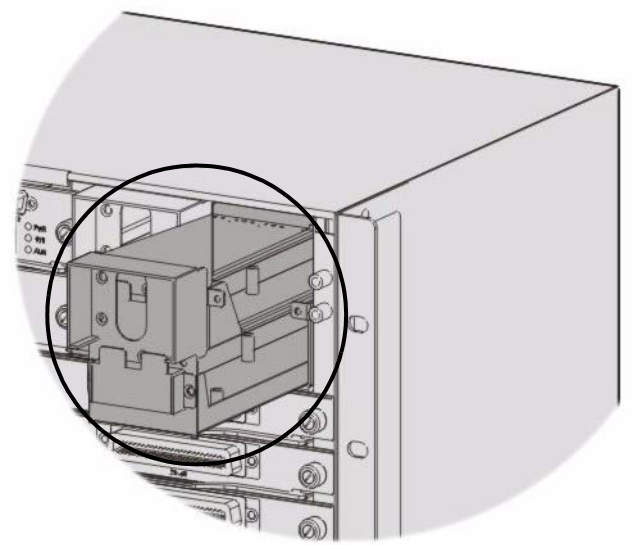
1. Refer to Section 4.2.1 on page 50 to disconnect the power before you begin.
2. Loosen the thumbscrews on the front panel of a power supply module.
3. Slide out the power supply module.

4 Replace any fuses that are burnt out (see Section 2.3 on page 26 for fuse information). If the fuses are not the problem, replace the power module with a new one from the manufacturer.

5 Slide the power module back into the power module slot.

6 Tighten the thumbscrews.

Figure 29 IES-5000 Power Module



4.2.3 Procedure to Reconnect the Power

1 Reconnect the power wires to the IES-5000's power module terminals.

2 Reconnect the power wires to the power supply's power terminals.

3 Turn the power supply back on.

4 Turn the IES-5000 power module switch back to the ON position.

4.3 Hardware Troubleshooting

This section explains how to troubleshoot the system hardware.

4.3.1 The PWR LED Does Not Turn On

Table 9 SYS LED Troubleshooting

STEP	CORRECTIVE ACTION
1	Make sure the power wires are properly connected to the power supply and the power supply is operating normally. Make sure you are using the correct power source (refer to Section 2.1.4 on page 24). Make sure the power supply modules are turned ON. Refer to Section 4.2 on page 50.
2	Make sure the chassis card is properly installed in the chassis.
	The LED itself or the unit may be faulty; contact your vendor.

4.3.2 The ALM LED Is On

The management switch card's ALM (alarm) LED lights when the IES-5000 is overheated and/or the fans are not working properly and/or voltage readings are outside the tolerance levels.

The ALM (alarm) LEDs on the DSL line cards light when the card is overheated and/or voltage readings are outside the tolerance levels.

Table 10 ALM LED Troubleshooting

STEP	CORRECTIVE ACTION
1	Go to the **Hardware Monitor** screen in the web configurator to verify the cause of the alarm. See step 2 if the unit is overheated, step 3 if the problem is with the fans and step 4 if the voltages are out of the allowed ranges.
2	Ensure that the IES-5000 is installed in a well-ventilated area and that normal operation of the fans is not inhibited. Keep the bottom, top and all sides clear of obstructions and away from the exhaust of other equipment.
3	Make sure you can feel and/or hear the fans working (working fans emit a low buzz and blow air). If the fans are not working properly, refer to Section 4.1 on page 49 for instructions on changing a fuse or changing the fan module.
4	If the voltage levels are outside the allowed range, take a screen shot of the Hardware Monitor web configurator screen and contact your vendor.

4.3.3 No Voice on an ADSL Connection

The ADSL line cards allow the telephone wiring used for DSL connections to also simultaneously carry normal voice conversations.

Table 11 Voice Troubleshooting

STEP	CORRECTIVE ACTION
1	Make sure the subscriber has a POTS splitter properly installed.
2	Check the telephone wire connections between the subscriber and the MDF(s).

Table 11 Voice Troubleshooting

STEP	CORRECTIVE ACTION
3	Check the telephone wire and connections between the MDF(s) and USER port(s). Refer to the pin assignments in the line card User's Guide.
4	Check the telephone wire and connections between the MDF(s) and the CO port(s). Check the telephone wire mapping on the MDF(s).
5	Check the connection from the MDF(s) to the PBX or the telephone company PSTN or ISDN switch.
6	Make sure the in-house wiring works and is connected properly.
7	Repeat the steps above using a different DSL port.

4.3.4 Testing Wiring

Use the following tests if there is no voice.

Systematically test wiring using a functioning telephone to determine if there is a wiring problem. If the connection is good, the telephone will return a dial tone. Letters in the figure shown next indicate the systematic tests to be done. Suppose you're using installation scenario "B" as shown in the chapter on MDF connections. The logic for other scenarios should be similar.

Use steps A-D if there is no voice but you can transmit data. Use all of the steps if there is no voice and you cannot transmit data.

Figure 30 Testing In-house Wiring

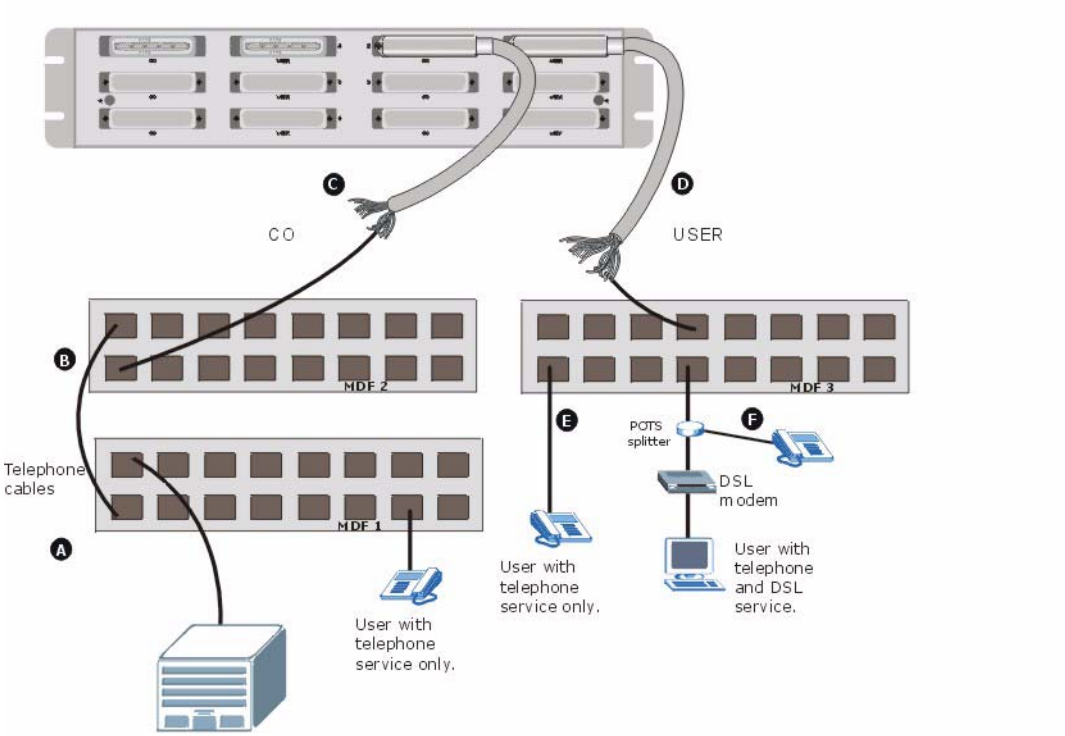


Table 12 Testing Wiring

STEP	TEST
A	**Wiring problem between the CO and MDF 1.** Connect a standard telephone to MDF 1. If there is no dial tone, then a problem with the wire or wire connections between MDF 1 and the CO exists. Contact your telephone company for troubleshooting.
B	**Wiring problem between MDF 1 and MDF 2.** Connect a telephone to the upper port of MDF 2. If there is no dial tone, then the problem is between MDF 1 and MDF 2. Check the telephone wire and connections between MDFs 1 and 2.
C	**Wiring problem between MDF 2 and the USER Telco-50 connector on the IES-5000 splitter chassis.** Disconnect the Telco-50 cable from the IES-5000 splitter chassis' Telco-50 CO connector. Connect a telephone to the appropriate pins of the Telco-50 cable's Telco-50 connector. If there is no dial tone, then the problem is between the IES-5000 splitter chassis Telco-50 CO connector and MDF 2. Check the Telco-50 cable's pin assignments (refer to the line card User's Guide for the proper pin assignments). Replace the Telco-50 cable if the pin assignments are okay and there is still no dial tone.

Table 12 Testing Wiring

STEP	TEST
D	**Problem with a splitter card or the splitter chassis.** Reconnect the Telco-50 cable to the IES-5000 splitter chassis' Telco-50 **CO** connector. Disconnect the Telco-50 cable from the IES-5000 splitter chassis' Telco-50 **USER** connector. Connect a telephone to the appropriate pins of the IES-5000 splitter chassis' Telco-50 **USER** connector (refer to the line card User's Guide for the proper pin assignments). If there is no dial tone, make sure that the splitter card is properly installed. Try a different splitter card. If using a different splitter card solves the problem, replace the first splitter card. If using a different splitter card does not solve the problem, the splitter chassis may be faulty, contact your vendor.
E	**Wiring problem between the USER Telco-50 connector on the IES-5000 splitter chassis and MDF 3.** Reconnect the Telco-50 cable to the chassis' Telco-50 **USER** connector. Connect a telephone to a lower port of MDF 3. If there is no dial tone, then the problem is between the chassis Telco-50 **USER** connector and MDF 3. Replace the Telco-50 cable connecting the **USER** port to MDF 3. If the problem remains, check the pin assignments of the USER Telco-50 connector. If the problem remains, then the IES-5000 or MDF 3 is faulty. Repeat the test in step A using MDF 3 to determine if MDF 3 has problems. Contact the telephone company if that is the case. If not, contact your IES-5000 vendor outlining the problem and the steps you took to solve it.
F	**Building-wiring problem between the subscriber's wall jack and MDF 3.** Disconnect the DSL modem from the wall jack and connect the telephone to the wall jack. If there is no dial tone, then there is a problem with the building wiring between the DSL subscriber's home and the MDF. Contact your telephone company for troubleshooting.

Appendix A
Product Specifications

See also the Unit Data chapter for a general overview of the key features.

Specification Tables

Table 13 System Wide Specifications

Operation Temperature	0° C ~ 50° C
Storage Temperature	-40°C ~ 70° C
Operation Humidity	5% ~ 95% RH (non-condensing)
Storage Humidity	5% ~ 95% RH (non-condensing)
Certifications	CE Conformity FCC ITU-T K.20 Safety IEC 60950-1 EN 60950-1 CSA 60950-1 UL 60950-1 EMC EN 300386 EN 55022 EN 61000-3-2 EN 61000-3-3 EN 55024 Complies with ETSI 300019

Table 14 IES-5000M Chassis Specifications (without cards)

Dimensions	440.0 mm (W) x 250 mm (D) x 288.9 mm (H) 19-inch or 23-inch, 6.5 U rack mountable
Weight	10.0 kg
Number of Slots	Eight line cards Two management switch cards One fan module Two power modules

Table 14 IES-5000M Chassis Specifications (without cards)

Fan Module	Hot swappable Six fans Removable filter
Power Module	Hot swappable Two 300V/20A 10mm terminal blocks with dual inputs
Power Consumption	Max 700 W -48 to -60 VDC 20 A Max
Backplane	Eight 1-Gigabit Ethernet (SerDes) ports

Table 15 IES-5000ST Chassis Specifications (without cards)

Dimensions	440 mm (W) x 280 mm (D) x 240 mm (H) 19-inch or 23-inch, 6.5 U rack mountable
Weight	10.4 kg
Number of Slots	16 splitter or extension cards

Table 16 IES-5005M Chassis Specifications (without cards)

Dimensions	440 mm (W) x 250 mm (D) x 152 mm (H) 19-inch or 23-inch, 4 U rack mountable
Weight	7.0 kg
Number of Slots	Four line cards One management switch card One fan module Two power modules
Fan Module	Hot swappable Three fans Removable filter
Power Module	Hot swappable Two 300V/20A 10mm terminal blocks with dual inputs
Power Consumption	Max 350 W -36 to -72 VDC 10 A Max
Backplane	Four 2-Gigabit Ethernet (SerDes) ports

Table 17 IES-5005ST Chassis Specifications (without cards)

Dimensions	440 mm (W) x 280 mm (D) x 125 mm (H) 19-inch or 23-inch, 6.5 U rack mountable
Weight	6.6 kg
Number of Slots	Eight splitter or extension cards

The following table describes required wire types and sizes.

Table 18 Wire Gauge Specifications

WIRE TYPE	REQUIRED AWG NO. (DIAMETER)
Ground Wire	12 or larger
Telephone Wire	26 or larger
Power Wire	12 or larger

The following table describes the lengths of ZyXEL's optional Telco-50 cables.

Table 19 Telco-50 Cable Lengths

CABLE	LENGTH
Long Telco-50	71 cm
Short Telco-50	38 cm

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